ACIDOSIS IN SKIN DISEASES *

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Our attention was first called to the subject of lowered alkalinity in seborrheic eruptions by the article of Barber and Semon [1] published in 1918. In a series of observations on soldiers in the British army, who had seborrheic eruptions, they found a pronounced and remarkably constant hyperacidity of the urine. This led them to the assumption that the seborrheic state is really a manifestation of relative acidosis. When the possibility of the existence of acidosis occurred to them, they began to test the therapeutic effects of giving alkali mixtures and making local applications of alkalies. Beneficial results were immediately apparent. From their clinical and chemical (urine) examinations, they considered that they had established these two fundamental facts:

1. That the majority of patients with seborrheic manifestations show a markedly increased alkaline tolerance, many of them to an astounding degree.

2. That in nearly all cases all active inflammatory processes cease, and the eruption rapidly clears when the urine has been rendered alkaline. Barber and Semon [1] did not examine the blood of their patients to determine whether there was a lowering of the alkali reserve, their investigations being limited to chemical examinations of the urine. In 1919, Schwartz, Levin and Mahnken [2] reported the results of examinations of the blood to determine the alkali reserve in 139 cases of various skin diseases. They found that 59.7 per cent. gave normal values, 35.9 per cent. showed a mild acidosis, while 3.5 per cent. gave a moderate acidosis, and one case had a severe acidosis, but the skin condition here was a complication of diabetes. Their

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* Read before the Section on Dermatology at the Seventy-First Annual Session of the American Medical Association, New Orleans, April, 1920.

1. Barber and Semon: Etiology and Treatment of Seborrhoeic Eruptions, Brit. M. J. **2**:245 (Sept.) 1918.

2. Schwartz, Levin and Mahnken: The Alkali Reserve in Various Diseases of the Skin, J. Cutan. Dis. **38**:9 (Sept.) 1919.

conclusions were that a lowering of the alkali reserve has been found sufficiently often in acne, psoriasis, urticaria, furunculosis and eczema (especially seborrheic) to warrant further investigation.

In the series of cases which we have studied, we have selected only extensive and well-marked examples of the condition. We thought that if relative acidosis were a constant accompaniment, it should be more marked in extensive and widely spread cases.

In conversing with Prof. L. G. Rowntree, whose experience in acidosis studies is extensive, he stated that he had not encountered any particular integumentary manifestation, and we, therefore, conclude that if the "seborrheic state" were a manifestation of acidosis, it should be encountered with relative frequency by one who sees acidosis constantly and in a large number of cases, occurring in a variety of conditions.[3]

Acidosis is a condition in which the concentration of bicarbonates in the blood is reduced below the normal level.[4] It is a secondary occurrence in diabetes, nephritis, certain types of diarrhea, recurrent vomiting, food intoxication and in cases in which the patient is moribund. In our series of cases, we determined the alkali reserve and in cases in which there was a marked variation, or because of some special indication, we did a complete metabolic study, including basal metabolism, and thorough physical examination by an internist. This was done to rule out some other condition which might account for the acidosis present.

DETERMINATION OF ALKALI RESERVE

In determining the alkali reserve, we found the most dependable test was the Van Slyke.[5] Oxalated blood plasma was saturated with carbon dioxid by means of repeated rotation in a separating funnel with expired air. One cubic centimeter of this plasma was placed in the receiving cup of the Van Slyke apparatus and rendered alkaline with a drop of normal ammonia. One drop of 1 per cent. solution of phenolphthalein was used as an indicator. The mixture was covered with a few drops of ethyl alcohol and drawn into the apparatus by lowering the mercury bulb. The receiving cup was washed with from 0.5 to 1 c.c. of distilled water, and this washing was likewise drawn into the apparatus. Normal sulphuric acid was then placed in the receiving cup and permitted to flow into the apparatus until the total volume of 2.5 c.c. was reached.

3. Rowntree, L. G.: Personal communication.
4. Sellard, A. J.: Principles of Acidosis, Cambridge, Harvard Press, 1917.
5. Gradwohl, M.: Blood and Urine Chemistry, St. Louis, The C. V. Mosby Co., 1917.

The mercury bulb was lowered after closing the apparatus. The carbon dioxid found as sodium bicarbonate was liberated in a vacuum by the action of the sulphuric acid and the amount of carbon dioxid read off directly by leveling the mercury in the bulb, and in the graduated tube of the Van Slyke instrument. In all cases, the greatest care was taken to insure that the apparatus was absolutely tight, and to prevent the loss of carbon dioxid.

Normal values measured as tension of carbon dioxid are considered as varying from 80 to 53 volumes per cent. Figures between 53 and 40 volumes per cent. are taken to indicate a mild acidosis; figures below 40 volumes per cent. as more severe types of acidosis.

Alveolar air collections were made by the Ploesch method. The determinations were made on a Haldane instrument for air analysis, and the results given as tension in millimeters of mercury. The values found are essentially the same as those determined by the Van Slyke instrument, the source of the carbon dioxid being the same substance — sodium bicarbonate — in each case. Collection required the cooperation of the patient, however, and in many cases this was rendered difficult, or impossible, due to the patient's failure to understand the directions given. We used this method in some cases, but always depended on the Van Slyke instrument.

DETERMINATION OF BASAL METABOLISM

Basal metabolisms were determined after the patient had fasted fourteen hours. Air was collected in a spirometer, fashioned after the "Tissot" instrument. In each case, the patient breathed into the instrument for ten minutes, after being at absolute rest for half an hour. Duplicate air analyses were made in a Haldane instrument, and the total amount of oxygen absorbed calculated. The respiratory quotient being found, the calorific value of oxygen for the quotient in question was taken, and the number of calories of oxygen per square meter of body surface per hour calculated. Surface areas were derived from the du Bois tables and our normal figures from Miss Sandiford's table in use at the Mayo clinic. In some cases extensive eruptions on the face of the patient made the mask used in collecting the air very uncomfortable; this introduced an unavoidable element of error due to the restlessness of the patient.

Basal metabolism figures are given in percentages of deviation from the normal. Values less than 10 per cent. above or below represent normal metabolism.

SEBORRHEIC DERMATITIS

Barber and Semon[6] point out that the exudative diathesis of infancy is often a forerunner of what they call the seborrheic diathesis

6. Semon, H. C.: Sycosis Barbae, Practitioner **104**:48 (Jan.) 1920.

in adult life. In a urine and blood chemistry study of exudative cases, one does not find any degree of acidosis; in fact, the reverse is the tendency. There is an increase in fluids and there is no acetone in the urine. We were not able to find any literature on blood chemistry find-

FINDINGS IN VARIOUS SKIN DISEASES

Name	80-53 Volumes per Cent. Normal	53-40 Volumes per Cent. Mild Acidosis	Remarks or Other Data
Seborrheic dermatitis:			
P. R.	65.3		
J. B.	61.4		
M. H.	61.4		
J. C. B.	....	52.5	Four months pregnant
M. H.	60.5		
H. B.	54.1		
M. P.	63.0		
Eczema:			
P. G.	65.4	....	Basal metabolism, 15 per cent.
J. T.	56.0		
D. O.	72.9		
Mrs. H.	60.5		
C. B.	....	44.3	Chronic interstitial nephritis; alveolar carbon dioxid, 3.95
C. M.	63.3		
W. O. F.	65.3		
A. G.	60.5		
M. J.	59.4		
T. L. D.	....	49.5	Beginning nephritis; focal infection; creatinin, 1.9; urea nitrogen, 30.0; uric acid, 4.1; hemoglobin, 71 per cent; blood sugar, 0.09
Psoriasis:			
A. C.	53.4		
L. C. C.	57.4		
W. E.	57.0		
G. G.	....	51.0	Nephritis; creatinin, 1.9; urea nitrogen, 25.6; uric acid, 3.42
H. W.	59.7		
H. W. W.	61.7		
Gar.	56.7		
Mrs. K.	....	49.5	Focal infection; arteriosclerosis; nitrogen retention
Parapsoriasis:			
P. L.	58.0		
Miss H.	57.0		
Acne vulgaris:			
J. L.	71.0		
E. J. O.	54.8		
T. B.	58.9		
G. L.	59.0		
G. K.	....	47.6	
A. M.	74.0		
Dermatitis herpetiformis:			
V. J.	67.0		
G. M.	58.6		
Acute lupus erythematosus (disseminated)			
A. W.	....	47.8	Moribund
Acute exfoliative dermatitis:			
M. M.	62.0		
Alopecia universalis:	60.4		
Furunculosis:			
G. H.	57.65		

ings on patients with exudative diathesis. Inquiry among pediatricians disclosed the fact that in a large series of cases of acidosis observed, due to a variety of causes, no cases of infantile eczema or seborrheic dermatitis were encountered.[7]

7. Seham, M.: Personal communication.

In our own studies, we have been unable to establish the existence of a seborrheic state, or seborrheic diathesis. We have found no consistent change in the alkali reserve and have not found even a mild acidosis which could not be accounted for.

The alkali therapy in our hands has not been successful. We have obtained better results by placing the patients on a fat-free diet and using the ordinary well-known lotions and ointments.

PSORIASIS

We thought that if any disease would show a metabolic change, psoriasis would. The psoriasis cases were selected. Only well-marked, widely distributed cases were chosen, and these were chosen at the height of an outburst. In no cases did we find a marked change in the alkali reserve. Complete blood chemistry was done in four cases, and in all four there was an increased urea nitrogen. In three cases of psoriasis there was marked focal infection. One patient with psoriasis had a marked arteriosclerosis, although he was only 22 years of age. Rest in bed and cleaning up of foci caused such remarkable improvement in his general condition that the psoriasis, which had previously been inveterate, promptly responded to treatment. From this small experience with psoriasis, we have decided that it is advisable to have every psoriatic patient carefully examined by a competent internist, especially for infected foci.

We used alkalies in the treatment of ten patients with psoriasis, giving heavy doses of sodium bicarbonate internally and paste of equal parts of sodium bicarbonate and petrolatum externally. In none did we find striking improvement. One patient became quite ill from the heavy bicarbonate dosage (2 ounces, three times a day). He complained of severe depression, anorexia and marked irritability.[8]

CONCLUSIONS

1. We could find no marked, nor consistent change in the alkali reserve in psoriasis, acne vulgaris, eczema and seborrheic dermatitis.

2. Promiscuous alkali therapy is unscientific and inadvisable, and may produce a condition of alkalinosis which may be dangerous to the patient.

REGARDING BLOOD OR URINE CHEMISTRY

3. We have failed to find in the blood and urine the evidence of the so-called "seborrheic state."

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8. Bayliss, W. M.: Acidosis and Hydrogen-ion Concentration, Brit. M. J. 2:395 (Oct.) 1918.

4. We depended on the Van Slyke test in acidosis. The advisability of accepting changes in urinary acidity as evidence of acidosis is questionable, especially when such a simple and accurate test as the Van Slyke is obtainable.

5. We realize the number of cases studied is not conclusive, but they are suggestive of negative findings.

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ABSTRACT OF DISCUSSION

DR. RICHARD L. SUTTON, Kansas City, Mo.: I have found alkaline therapy efficient in infantile eczema, furunculosis and infectious eczematoid dermatitis. It is important to emphasize one of the points made by the authors, and that is, to be sure that excessive amounts of alkalies are indicated and can be taken care of by the patient. Otherwise, one is liable to come to grief.

DR. AUGUSTUS RAVOGLI, Cincinnati: The acidosis has a great deal of influence on the collagenous tissues. If we try to dissolve fibrin in some acid solutions the fibrin does not dissolve, but if we add some alkaline substance, then the fibrin will dissolve. The same thing happens in the collagenous tissues of the skin which, as a consequence of the acidosis, are made impermeable, and this causes edema. The edema is produced by the collagenous tissues retaining the serum, or better the lymph, as it is difficult for the albumin to be dissolved. The albumin in the urine when the kidney is inflamed is just the same condition as edema in the skin.

DR. SAMUEL E. SWEITZER, Minneapolis: We were disappointed at not being able to find acidosis, because when I began this work I thought that if some of the cases of seborrheic dermatitis and of eczema were due to acidosis it would be of value. We were disappointed at not being able to come to agreement with other writers in regard to this matter.